

Hunting for the Eastern Elk

By Sarah Mann, College of Letters & Science

The 300-year-old bones of a possibly extinct species, trapped until just recently in the muck and water of a Michigan lake, arrived in Biological Sciences Associate Professor Emily Latch's laboratory in a decidedly unglamorous fashion: They were shipped by FedEx.

Latch's lab is the latest stop on one young girl's incredible journey. Ten-year-old Sonja Moehle, known as Sunny, was kayaking with her father earlier this year when she looked down into the lake and saw what looked to be some odd tree branches. On further examination, they turned out to be a massive set of antlers. With her family, Sunny began a Kickstarter campaign online to raise money to excavate the bones and further research them through radiocarbon dating and genetic testing. The radiocarbon dating placed the bones at around 300 years old, and professors at the University of Michigan told Sunny that she likely had an elk on her hands.

"Although there are elk in northern Michigan, they've been introduced there and are closely monitored within a fairly restricted distribution," Latch said. "The bones are from a large animal, so the elk is larger than what you would see there today for the introduced population. Combined with radiocarbon dating, this suggests the bones might be from an extinct Eastern Elk, for which there are very few fossils."

There are six subspecies of elk in North America, she explained. Four are extant, or still existing, while two, including the Eastern Elk, are extinct. Sunny and her family asked Latch to do a genetic analysis of their bones to compare to the genome of extant elk species in order to see if this could really be an extinct Eastern Elk. The subspecies died out in 1877 due to overhunting.



James Audubon's rendering of an Eastern Elk.

Sunny and her family got in touch with Latch at the suggestion of an expert who knew of Latch's work with other ungulates like deer. She and the Moehles hit it off right away.

"When we finally got to meet Emily via a Skype meeting, Sunny immediately felt special. She put this 10-year-old scientist immediately at ease," Sunny's mother, Amy Moehle, said in a phone call from the family's Michigan home.

Genetic testing was a tall order on bones this old and damaged, Latch said. The DNA in the elk bones is considered "ancient DNA," meaning that there isn't much DNA present and what is there will be of a very low quality, since the bones were damaged due to weathering through water, mud, sun, and ice exposure. She and her research specialist, UWM alumna and Conservation and Environmental Science major

Brittany Suttner, followed strict protocols to make sure they didn't contaminate the elk DNA with any other genetic material.



UWM Associate Professor of Biological Sciences Emily Latch, left, watches as research assistant Brittany Suttner uses a dremel tool to drill for bone dust in a 300-year-old elk jaw bone.

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Extinct elk

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To extract DNA for sequencing, Suttner drilled into the femur and the jawbone of the elk with a dremel tool to carve out a small amount of bone powder. She carefully washed the DNA, separated it from other proteins and materials in the solution, and concentrated the DNA to yield as much as possible from the degraded sample. Suttner then used an elk-specific primer and polymerase chain reaction (PCR) to amplify the DNA region of interest. In this study, she was interested in targeting the mitochondrial DNA, because it exists in higher copy number within each cell and it is more robust to degradation.

“We have our little pieces of DNA that we want, and now we need to sequence them,” Suttner said. “We’ll use fluorescently-labeled nucleotides. We attach those and then I’ll run them on our sequencing machine. When our fragment with the fluorescent base comes through, it emits light, which our machine measures.” DNA is made up of base pairs of four different chemicals, signified by the letters G, A, T, and C. Different colors of fluorescence indicate a specific base. Based on the measurements of the machine, Suttner created a computer model of what specific areas of the elk’s DNA looked like. Then, she began comparing them to the DNA of extant elk, looking for any differences that might indicate the elk’s origin.

“You can do a lot in terms of using quantitative genetics to study behavior and things, but what we’re mostly interested in is a species ID,” Latch said. “In this case, we would be interested in just sequencing a portion of this elk’s DNA and then comparing it to other elk’s DNA and just looking for matches and mismatches, and then coming up with a hypothesis based on what we find.

“I think there’s some good evidence to suggest that it’s an Eastern Elk,” Latch added. She can’t say for certain, since there is no other existing Eastern Elk DNA to compare these bones to, but the age, size, and location of the bones provide some good evidence. Latch hopes that her genetic analysis can provide information for the next research who studies the topic.

In the meantime, while Latch was testing the DNA, Sunny and her family were at the Smithsonian Museum in Washington, D.C., one of the few places in the U.S. to have Eastern Elk bones, to conduct more research. That might end up being the bones’ final resting place after Sunny’s scientific inquiries are complete, but the Moehles aren’t sure yet.

“(Kris Helgen, Curator of Mammals at the Smithsonian) said it’s scientifically valuable and they’d like it very much, but he explained to Sunny that it’s her find and she can do what she wants with it,” Amy Moehle said. Sunny plans to continue her research to find out as much as she can about the elk and then find the best possible resting place for the bones where they can inspire others, whether that’s at the Smithsonian or another appropriate museum.

And, Latch added, this is a good reminder that science can be very exciting.

“I think the fact that a 10-year-old made this discovery, that she’s now super-excited about science, that her parents are encouraging her and letting her pursue this, the fact that she did a Kickstarter Fund and raised money for scientific research and that she’s so psyched about it – this is great for science,” Latch said. “Even on the days when it’s really hard and you can’t figure it out, you have to remind yourself, science is fun.”

Learn more about Sunny and the elk on her [Kickstarter Page \(http://kck.st/1BI9MSz\)](http://kck.st/1BI9MSz) or at SunnyandtheElk.org.



Sunny Moehle and her father David Moehle show off the enormous antlers of their find. Photo courtesy of the Moehle family.